Human Effectiveness Directorate

Distributed Mission Training (DMT) Threat Systems

Glenn Cicero, AFRL/HEAE

DMT Threat System

- **Need for new approach to training**
  - **Past simulations supported threat recognition and procedures training only**
    - **This allowed substantially simplified models to be used (threat models and avionics models)**
  - **Current training requirements exceed basic recognition and procedures requirements**

DMT Threat System

- Mission Training Requirements
  - Physics-based threat models
    - » Real beam scans modeled
    - » Current Electronic Warfare Integrated Reprogramming-based parametric data
    - » DIA-approved weapon fly-out data and algorithms
      - NAIC Airborne systems/weapons
      - TSMO SAM/C3
      - NGIC AAA
    - » HLA/DIS compliance
    - » Object orientation

DMT Threat System

- Mission Training Requirements (cont.)
  - Real-Time interaction with environment
    - » Electronic parametrics based on EWIR data
    - » Dynamically calculated terrain clutter
      - Digital Radar Landmass Simulation
    - » Dynamically calculated Doppler velocities
    - » Dynamically calculated atmospheric propagation
      - Weather models
    - » Dynamically calculated Clutter/Free Space detection determination

Avionics Simulation

- AN/ALR-69 Radar Warning Receiver
  - True bit-wise compatible replication of actual system
    - » No “short-cuts”. Line-by-line translation
  - Pulse-to-Pulse level replication
    - » 1/10 microsecond accuracy
    - » “Real world” limitations behavior captured
      - Anomalous/spurious signal indications
      - Late/missed signal detections
      - High pulse-density degradation

Chaff Model

- **Chaff dynamic data as described by SURVIAC documents**
  - **Frequency dependent Radar Cross Section (RCS)**
  - **Bloom rates aircraft speed dependent**
  - **Fall rates/hang time**
  - **Doppler/Free space clutter**
  - **Chaff model implementation affects all appropriate entities throughout the network**

AFRL/HEA Accomplishments

- Created true bit-wise compatible replication of AN/ALR69 radar warning receiver (RWR) running real time
- Created threat behavior models that dynamically account for terrain clutter degradation and target actions and reactions (non-scripted)
- Threat database modeled with parametric data required to exhibit true physics-based performance characteristics
- Basic ECM waveforms modeled
  - RGPO, VGPO, Noise, AGWO

Fire-Control Radar

Planned Additions

- **Sophisticated ECM waveforms**
  - **Correlated RBM/VBM**
- **Incorporate Chaff model (RR-170)**
  - **Model already developed, need additional hardware**
- **Incorporate full 6-DOF missile fly-out and threat aircraft aerodynamic behaviors**
  - **Data in-house now, need additional hardware**